

01/18/00
jc525 U.S. PTO

Attorney Docket No. SAMJ-098
PATENT

A
jc490 U.S. PTO
09/484974
01/18/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): Han Ju Yu, et al.

For (title): MOVING PICTURE EXPERTS
GROUP DECODING APPARATUS
AND METHOD FOR CAPTION
DISPLAY

1. **Type of Application** This new application is for
a(n)

- ☒ Original (nonprovisional)
☐ Design
☐ Plant
☐ Divisional.
☐ Continuation.
☐ Continuation-in-part (C-I-P).

2. **Benefit of Prior Application(s)**

- ☒ The new application being transmitted claims the benefit of prior Korean application(s) no.
99-3221. See item 7.

3. **Papers Enclosed**

8 Pages of specification
2 Pages of claims
1 Page of Abstract
4 Sheets of drawings
☒ formal
☐ informal
 Page of Cover Sheet

- ☐ The **enclosed** drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT
PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. 1.84(b).

<p align="center">CERTIFICATE OF MAILING 37 C.F.R. § 1.10 "Express Mail" Mailing Label Number <u>EL537136901US</u> I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to BOX PATENT APPLICATION, Assistant Commissioner for Patents, Washington, DC 20231. Date: <u>1-18-00</u> <u>Amy Lockhart</u> Amy Lockhart <u>Amy Lockhart</u> Print Name</p>
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4. Additional papers enclosed

- ☐ Preliminary Amendment
- ☐ Information Disclosure Statement (37 C.F.R. 1.98)
- ☐ Form PTO-1449 (PTO/SB/08A and 08B)
- ☐ Copies of cited references
- ☐ Declaration of Biological Deposit
- ☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.
- ☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative
- ☐ Special Comments
- ☒ Other: Return Postcard.

5. Declaration or oath

- ☒ Enclosed
 - ☐ Unexecuted
 - ☒ Executed by
 - ☒ inventors
 - ☐ legal representative of inventor(s).
37 CFR 1.42 or 1.43.
 - ☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.
 - ☐ This is the petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 is also attached. See item 12 below for fee.
- ☐ Not Enclosed
- ☐ Application is made by a person authorized under 37 C.F.R. 1.41 (c) on behalf of all the above named inventor(s).
 - ☐ Showing that the filing is authorized.

6. Assignment

- ☒ An assignment of the invention to Samsung Electronics Co., Ltd.
 - ☒ is attached. A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☒ FORM PTO 1595 is also attached.
 - ☐ will follow.

7. Certified Copy

Certified copy(ies) of application(s)

Korea	99-3221	01 February 1999
Country	Appln. no.	Filed
Country	Appln. no.	Filed
Country	Appln. no.	Filed

from which priority is claimed

☒ is (are) attached.

☐ will follow.

8. Fee Calculation (37 C.F.R. 1.16)

CLAIMS AS FILED				
	Number filed		Number Extra	Rate
Basic Fee 37 C.F.R. 1.16(a) \$690.00				
Total				
Claims (37 CFR 1.16(c))	4	- 20 =	0	\$ 18.00
Independent				
Claims (37 CFR 1.16(b))	2	- 3 =	0	\$ 78.00
Multiple dependent claim(s), if any (37 CFR 1.16(d))			+	\$260.00

☐ Amendment cancelling extra claims is enclosed.

☐ Amendment deleting multiple-dependencies is enclosed.

☐ Fee for extra claims is not being paid at this time.

Filing Fee Calculation

\$ 690.00

9. Small Entity Statement(s)

- ☐ Verified Statement(s) that this is a filing by a small entity under 37 CFR 1.9 and 1.27 is (are) attached.
- ☐ Status as a small entity was claimed in prior application _____, filed on _____
from which benefit is being claimed for this application under:

35 U.S.C. ☐ 119(e),
☐ 120,
☐ 121,
☐ 365(c),

and which status as a small entity is still proper and desired.

- ☐ A copy of the verified statement in the prior application is included.

Filing Fee Calculation (50% of A, B or C above)

\$ _____

10. Fee Payment Being Made at This Time

- ☐ Not Enclosed
- ☐ No filing fee is to be paid at this time.
(This and the surcharge required by 37 C.F.R. 1.16(e) can be paid subsequently.)

☒ Enclosed

☒ Basic filing fee \$ 690.00

☒ Recording assignment
(\$40.00; 37 C.F.R. 1.21(h))
(See attached "COVER SHEET FOR ASSIGNMENT
ACCOMPANYING NEW APPLICATION".) \$ 40.00

Total fees enclosed \$ 730.00

11. Method of Payment of Fees

☒ Checks in the amounts of \$ 690.00, 40.00

☐ Charge Account No. 19-0079 in the amount of \$ _____
A duplicate of this transmittal is attached.

12. Authorization to Charge Additional Fees


- ☒ The Commissioner is hereby authorized to charge the following additional fees during the entire pendency of this application to Account No. 19-0079.
- ☒ 37 C.F.R. 1.16(a), (f) or (g) (filing fees)
 - ☒ 37 C.F.R. 1.16(b), (c) and (d) (presentation of extra claims)
 - ☐ 37 C.F.R. 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)
 - ☐ 37 C.F.R. 1.17 (application processing fees)
 - ☐ 37 C.F.R. 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. 1.311(b))

13. Instructions as to Overpayment

- ☒ Credit Account No. 19-0079
- ☐ Refund

Date: January 18, 2000
Samuels, Gauthier & Stevens, LLP
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Respectfully submitted,


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01/18/00
Jc759 U.S. PTO

01-19-00

PATENT A

Attorney Docket No. SAM-098

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Han Ju Yu, et al.
Filing Date: January 18, 2000
Title: MOVING PICTURE EXPERTS GROUP DECODING APPARATUS
AND METHOD FOR CAPTION DISPLAY

CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.10

"Express Mail" Mailing Label Number EL537136901US I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated below and is addressed to BOX PATENT APPLICATION, Assistant Commissioner for Patents, Washington, DC 20231.

1-18-00
Date

Amy Lockhart
Amy Lockhart

BOX PATENT APPLICATION

Assistant Commissioner for Patents
Washington, DC 20231

TRANSMITTAL LETTER

Sir:

Enclosed herewith for filing in the above-identified patent application please find the following listed items:

1. New Application Transmittal;
2. New Patent Application;
3. Executed Declaration, Petition and Power of Attorney;
4. Four (4) Sheets of Formal Drawings;
5. Certified Copy of Priority Document - Korean Application No. 99-3221;
6. Check in the amount of \$690.00 to cover requisite fee;
7. Assignment Recordation Form Cover Sheet - - PTO-1595;
8. Executed Assignment;
9. Check in the amount of \$40.00 to cover assignment recordation fee; and
10. Return Postcard.

In connection with the foregoing matter, please charge any additional fees which may be due, or credit any overpayment, to Deposit Account Number 19-0079. A duplicate copy of this letter is provided for this purpose.

Respectfully submitted,

Date: January 18, 2000
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MOVING PICTURE EXPERTS GROUP DECODING APPARATUS AND METHOD FOR CAPTION DISPLAY

Background of the Invention

1. Field of the Invention

The present invention relates to a moving picture experts group (MPEG) decoder, and more particularly, to an MPEG decoder for caption display and a decoding method of the same.

2. Description of the Related Art

A video stream, which is decoded by an MPEG video decoder, has a structure in which a sequence header representing the start of a video sequence and a plurality of groups of pictures (GOPs) are consecutively arranged. Each GOP includes a GOP header and a plurality of pictures such as an I picture, a P picture, and a B picture.

The GOP header includes a user data area. For example, a twenty-first horizontal line in a video stream can be used as the user data area. This user data area is usually used to store caption information.

Generally, a caption function denotes a function of displaying, for example, a Korean or English-language caption on a display screen. In conventional systems, in order to perform a caption function, user data is extracted from the header information of the video stream. The extracted user data is applied as caption data to a video encoder, and generated as an internal caption signal.

FIG. 1 is a schematic block diagram of a conventional MPEG decoder. Referring to FIG. 1, the conventional MPEG decoder includes an MPEG A/V demultiplexer 100, an audio digital-to-analog converter (DAC) 110, a video decoder 120, a header first in first out (FIFO) memory 130, a central processing unit (CPU) 140, and a video mixer 150. Also, the video encoder 160 is shown in FIG. 1 for convenience of explanation.

The MPEG A/V demultiplexer 100 demultiplexes an MPEG stream applied from an input terminal MIN into a digital audio stream and a video stream. The audio decoder 105 decodes the audio stream applied from the MPEG A/V demultiplexer 100. The audio DAC 110

converts the decoded digital audio stream applied from the MPEG A/V demultiplexer 100 into an analog signal and outputs the analog signal via an audio output terminal A_OUT.

The video decoder 120 decodes the video stream applied from the MPEG A/V demultiplexer 100 and extracts user data USER_DATA from the GOP header of the video stream. The header FIFO memory 130 stores the user data USER_DATA extracted from the GOP header. The CPU 140 receives the user data USER_DATA from the header FIFO memory 130 and outputs the user data USER_DATA as caption information if the user data is determined to be caption information. The video mixer 150 mixes a video signal decoded by the video decoder 120 with on-screen-display (OSD) data applied from an OSD controller (not shown) and outputs the result to the video encoder 160. The video encoder 160 encodes the output of the video mixer 150 and the user data USER_DATA, that is, caption data, output from the CPU 140, and outputs the result of encoding via a video output terminal V_OUT.

In the conventional MPEG decoder shown in FIG. 1, user data USER_DATA extracted from the header of an MPEG video stream is directly output to the video encoder 160 in order to perform a caption function. The caption function is therefore achieved by expensive encoders or televisions which are specially manufactured to include the caption function. Thus, in the prior art, ordinary televisions cannot perform a caption function.

Summary of the Invention

An object of the present invention is to provide a moving picture experts group (MPEG) decoder for caption display in which caption data is output using an on-screen-display (OSD) module, thus allowing ordinary televisions to perform a caption function.

Another object of the present invention is to provide a decoding method performed in the MPEG decoder.

Accordingly, to achieve the first object, the present invention provides a moving picture experts group (MPEG) decoder for demultiplexing an external-applied MPEG stream into an audio stream and a video stream and for decoding the video stream and outputting the decoded video stream on a screen. The device includes a video decoder for decoding the video stream and extracting user data from the header information of the video stream. A header memory stores the user data. A central processing unit (CPU) produces caption data by decoding the user

data and transforms the caption data into on-screen-display (OSD) object data. An OSD controller transforms the OSD object data into pixel data in response to a predetermined enable signal and outputs the pixel data. A video mixer mixes the pixel data with the decoded video data.

To achieve the second object, the present invention provides a MPEG decoding method. An MPEG video stream is decoded, and user data is extracted from the header of the MPEG video stream. Caption data is produced by decoding the user data. The caption data is transformed into OSD object data, and the OSD object data is stored. The OSD object data is transformed into pixel data if an OSD enable signal has been applied. The pixel data is mixed with video data, and the resultant data is provided as output.

Brief Description of the Drawings

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention, as illustrated in the accompanying drawings in which like reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention.

FIG. 1 is a schematic block diagram of a conventional moving picture experts group (MPEG) decoder.

FIG. 2 is a schematic block diagram of one embodiment of an MPEG decoder for caption display according to the present invention;

FIG. 3 is a detailed schematic block diagram of the on-screen-display (OSD) controller in the MPEG decoder shown in FIG. 2.

FIG. 4 is a flowchart illustrating one embodiment of an MPEG decoding method according to the invention which can be performed in the MPEG decoder shown in FIG. 2.

Description of Preferred Embodiments of the Invention

Referring to FIG. 2, one embodiment of a moving picture experts group (MPEG) decoder for caption display according to the present invention includes an MPEG audio/video (A/V) demultiplexer 200, an audio digital-to-analog converter (DAC) 210, an input buffer 220, a video

decoder 230, a header first in first out (FIFO) memory 260, a central processing unit (CPU) 270, an on-screen-display (OSD) controller 280, and a video mixer 250. FIG. 2 also shows a video encoder 290.

The MPEG A/V demultiplexer 200 receives an MPEG stream from an external source via an input terminal MIN and demultiplexes the received MPEG stream into a digital audio stream and a video stream. The MPEG stream can be applied from a data processor of an external device such as a compact disc player (CDP) or a digital versatile disc player (DVDP). Also, the MPEG stream is defined as a signal which can be applied to a hard disc or a compact disc when it is adapted to computers.

The audio decoder 205 decodes the audio stream applied from the MPEG A/V demultiplexer 200. The audio DAC 210 converts the decoded digital audio stream into an analog audio signal and outputs the converted analog audio signal via an audio output terminal A_OUT. The input buffer 220 buffers the video stream and outputs the buffered video stream to the video decoder 230. The video decoder 230 decodes the video stream buffered by the input buffer 220 and outputs the decoded result to the video mixer 250.

The video decoder 230 includes an MPEG stream decoder 232, an inverse quantizer 234, an inverse discrete cosine transformer (IDCT) 236, a frame memory 237, a motion compensator 238, and an adder 239. The video decoder 230 decodes, inversely quantizes, and inversely discrete cosine transforms (IDCT) the video bit stream, compensates for the motion of the video bit stream, and outputs the result to the video mixer 250. Also, the video decoder 230 extracts user data USER_DATA from the group of picture (GOP) header information of the video bit stream.

The header FIFO memory 260 stores the user data USER_DATA extracted by the video decoder 230. The CPU 270 decodes the user data USER_DATA output from the header FIFO memory 260 and produces caption data. The caption data is transformed into OSD object data OSD_OBJ and is stored in the OSD buffer 282 of the OSD controller 280. Here, the OSD object data is defined as data including information on the positions, sizes and colors of OSD characters to be displayed on a screen.

Also, the CPU 270 produces an OSD enable signal OSD_EN (not shown) for displaying caption data on a screen. Here, the OSD enable signal OSD_EN may use the start bit of the

OSD object data OSD_OBJ, or a special enable signal may be produced and output to the OSD processor 284. The CPU 270 can be a reduced instruction set computer (RISC) processor.

The OSD controller 280 includes an OSD buffer 282 and an OSD processor 284. The OSD controller 280 transforms the OSD object data OSD_OBJ output from the CPU 270 into pixel data in response to the OSD enable signal OSD_EN and outputs the pixel data to the video mixer 250. The video mixer 250 mixes a video signal decoded by the video decoder 230 with the pixel data output from the OSD controller 280. The video encoder 230 encodes the data output from the video mixer 250 and outputs the encoded data via a video output terminal V_OUT. An audio signal output via the audio output terminal A_OUT and a video signal output via the video output terminal V_OUT are reproduced on a television monitor.

More specifically, in the video decoder 230 of the MPEG decoder shown in FIG. 2, the MPEG stream decoder 232 decodes a video stream received from the input buffer 220 and outputs a DCT coefficient DCT_CO and motion information MOT_INF. The motion information MOT_INF is information which can include a motion vector value for compensating for the motion of a video signal. The DCT coefficient DCT_CO is inversely quantized by the inverse quantizer 234, and the inversely-quantized result is IDC transformed by the IDCT 236.

The motion compensator 238 compensates for the motion between a present picture and a past picture which is stored in the frame memory 237, using the motion information MOT_INF vector output from the MPEG stream decoder 232. The adder 239 adds the compensated result of the motion compensator 238 to the output of the IDCT 236 and produces a decoded video signal. The video signal output from the adder 239 is stored as a past picture in the frame memory 237. It is used to compensate for the motion of a picture which is applied later.

As described above, the MPEG decoder shown in FIG. 2 extracts user data from the GOP header of an MPEG stream and decodes the user data. The decoded caption data is transformed into OSD data, and the OSD data is output via the OSD controller 280, such that a caption function is performed.

FIG. 3 illustrates an embodiment of the OSD controller 280 shown in FIG. 2. Referring to FIG. 3, the OSD controller 280 includes an OSD buffer 282 and an OSD processor 284. The OSD buffer 282 is usually installed in a memory such as a dynamic random access memory (DRAM). The OSD buffer 282 stores the OSD object data OSD_OBJ received from the CPU

270. The OSD object data OSD_OBJ can be considered as data transformed by caption information when a caption function is performed. However, when an ordinary function is performed, the OSD object data is considered as data for displaying ordinary OSD characters.

The OSD processor 284 reads the OSD object data from the OSD buffer 282, and transforms the OSD object data into pixel data. The OSD processor 284 includes a buffer interface unit 32, a text OSD (T_OSD) module 34, a bit map OSD (B_OSD) module 36, a text color loop-up table (T_CLUT) 35, a bit map color loop-up table (B_CLUT) 39, and an OSD mixer 37. The OSD processor 300 can be configured using one of T_OSD module 34 and B_OSD module 36. In this case, OSD mixer 37 is not used, but one look-up table of T_CLUT 35 and B_CLUT 39 is used. The buffer interface unit 32 in the OSD processor 284 receives the OSD object data OSD_OBJ from the OSD buffer 282 and transmits the same to the internal block of the OSD processor 284.

The T_OSD module 34, for displaying text information, receives the OSD object data OSD_DATA as text OSD information and transforms the text OSD information as pixel data. Also, the T_OSD module 34 includes a font look-up table for loading a bit map font. The B_OSD module 36 receives the OSD object data OSD_DATA as bit map OSD information and transforms the bit map OSD information as pixel data.

The T_CLUT 35 stores color information for outputting text OSD information, and B_CLUT 39 stores color information for outputting bit map OSD information. The OSD mixer 37 receives text pixel data from the T_OSD module 34 and bit map pixel data from the B_OSD module 36, mixes them, and outputs the result of mixing to the video mixer 250 via an output terminal OSD_OUT. As described above, the OSD object data OSD_OBJ transformed from caption data is transformed into pixel data by the T_OSD module 34.

FIG. 4 is a flowchart illustrating one embodiment of an MPEG decoding method for caption display according to the present invention. The MPEG decoding method includes steps 400 and 410 of decoding an MPEG video stream and of extracting user data from the header of the MPEG video stream, steps 420 and 430 of producing caption data by decoding the user data and of transforming the caption data into OSD object data, and steps 440, 460 and 470 of determining whether an OSD enable signal has been applied, of transforming the OSD data into

pixel data if the OSD enable signal has been applied, and of mixing the pixel data with video data and outputting the result.

The method of FIG. 4 will now be described in detail. The video decoder 230 of the MPEG decoder decodes an MPEG video stream in step 400. In this step, the MPEG stream decoder 232 decodes the MPEG video bit stream and produces a DCT coefficient DCT_CO and motion information MOT_INF. The DCT coefficient undergoes inverse quantization and IDCT processes. The resultant coefficient is added to motion-compensated video data, and the added result is applied to the video mixer 250. After the MPEG bit stream is decoded in step 400, the MPEG stream decoder 232 extracts user data USER_DATA from the header of the bit stream in step 410. Then, the user data USER_DATA is transmitted to the CPU 270 via the header FIFO memory 260. The CPU 270 decodes the user data USER_DATA and produces caption data in step 420.

In step 430, the CPU 270 transforms the received caption data into OSD object data OSD_OBJ and stores the OSD object data OSD_OBJ in the OSD buffer 282. Then, in step 440, a determination is made as to whether an OSD enable signal OSD_EN for displaying OSD data has been applied from the CPU 270.

If it is determined in step 440 that the OSD enable signal OSD_EN has been applied, the OSD processor 284 reads OSD object data from the OSD buffer 282 and transforms the OSD object data into pixel data, in step 460. That is, the T_OSD module 34 in the OSD processor 284 obtains pixel data corresponding to the OSD object data OSD_OBJ stored in the OSD buffer 282. On the other hand, if it is determined in step 440 that the OSD enable signal OSD_EN has not been applied, the operation of the MPEG decoder remains in a waiting condition in step 440.

When the OSD object data is transformed into pixel data in step 460, the OSD processor 284 outputs the pixel data to the video mixer 250. The video mixer 250 mixes the video data decoded by the MPEG video decoder 236 with the pixel data, in step 470. The output data of the video mixer 250 is encoded by the video encoder 290 and can be displayed on a television screen. Accordingly, conventional televisions can also perform a caption function by decoding an MPEG stream through the above-described processes.

According to the present invention, caption data is produced by extracting user information from the header of an MPEG video stream and decoding the user information, and the caption data is transformed into OSD data using OSD modules, so that ordinary televisions can perform a caption function. Also, the MPEG decoding method for caption display according

[illegible]

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2
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[illegible]

CLAIMS

1. A moving picture experts group (MPEG) decoder for producing a caption for display on a screen, said decoder producing a video stream from an externally-applied MPEG stream, the decoder comprising:
 - a video decoder for decoding the video stream and extracting user data from header information of the video stream;
 - a header memory for storing the user data;
 - a central processing unit (CPU) for (i) producing caption data by decoding the user data and (ii) transforming the caption data into on-screen-display (OSD) object data;
 - an OSD controller for transforming the OSD object data into pixel data in response to a predetermined enable signal and outputting the pixel data; and
 - a video mixer for mixing the pixel data with the decoded video data.
2. The MPEG decoder of claim 1, wherein the OSD controller comprises:
 - an OSD buffer for storing the OSD object data received from the CPU; and
 - an OSD processor for reading the OSD object data from the OSD buffer and transforming the OSD object data into pixel data.
3. The MPEG decoder of claim 1, wherein the OSD object data is considered data transformed from caption information when a caption function is performed, and considered data for displaying ordinary OSD characters when an ordinary function is performed.
4. An MPEG decoding method comprising the steps of:
 - (a) decoding an MPEG video stream;
 - (b) extracting user data from the header of the MPEG video stream;
 - (c) producing caption data by decoding the user data;
 - (d) transforming the caption data into OSD object data and storing the OSD object data;
 - (e) determining whether an OSD enable signal has been applied;

MOVING PICTURE EXPERTS GROUP DECODING APPARATUS AND METHOD FOR CAPTION DISPLAY

Abstract of the Disclosure

An MPEG decoder for caption display, and a decoding method for caption display are provided. The MPEG decoder demultiplexes an external-applied MPEG stream into an audio stream and a video stream and decodes the video stream and outputs the decoded video stream on a screen. The decoder includes a video decoder for decoding the video stream and extracting user data from the header information of the video stream. A header memory stores the user data. A central processing unit (CPU) produces caption data by decoding the user data and transforming the caption data into on-screen-display (OSD) object data. An OSD controller for transforms the OSD object data into pixel data in response to a predetermined enable signal and outputs the pixel data. A video mixer mixes the pixel data with the decoded video data. In this way, caption data is produced by extracting user information from the header of an MPEG video stream and decoding the user information. The caption data is transformed into OSD data using OSD modules, so that ordinary televisions can perform a caption function.

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FIG. 1 (PRIOR ART)

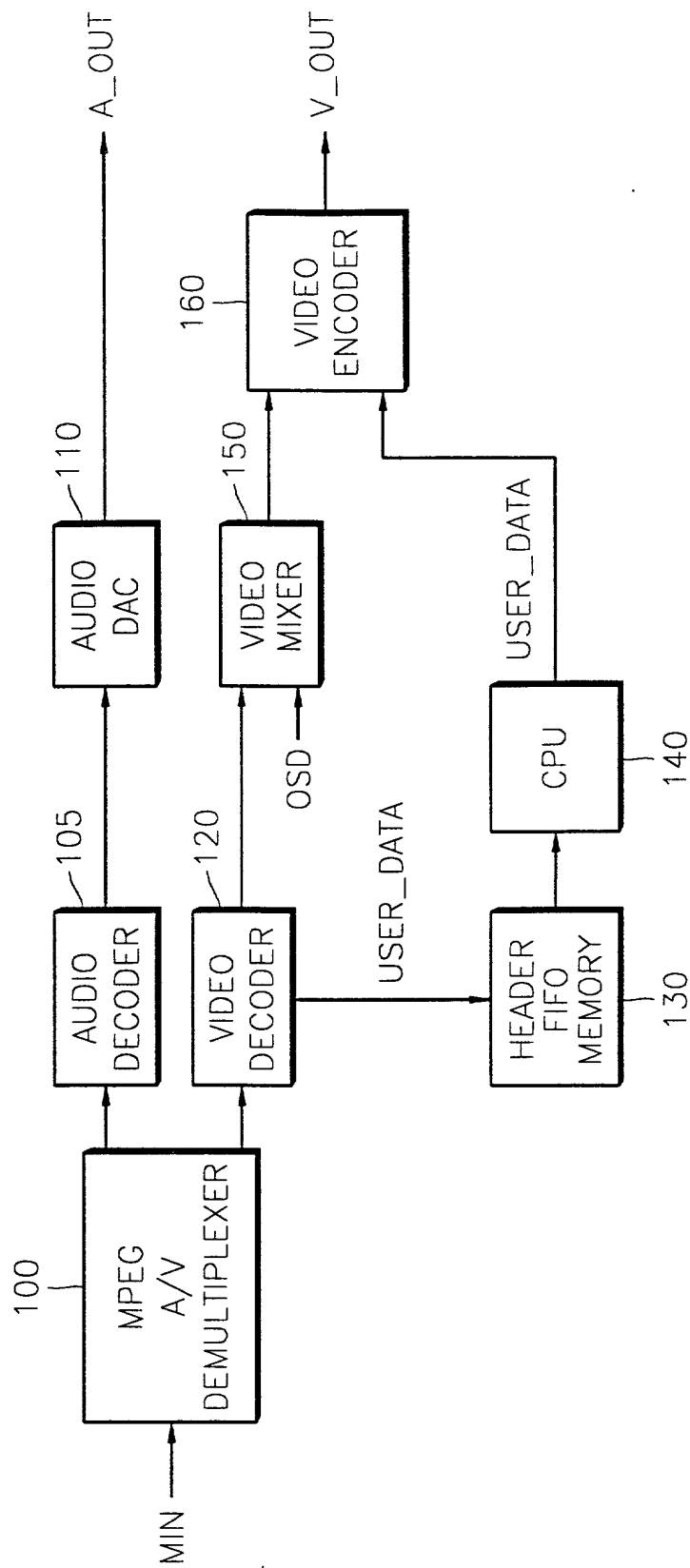


FIG. 2

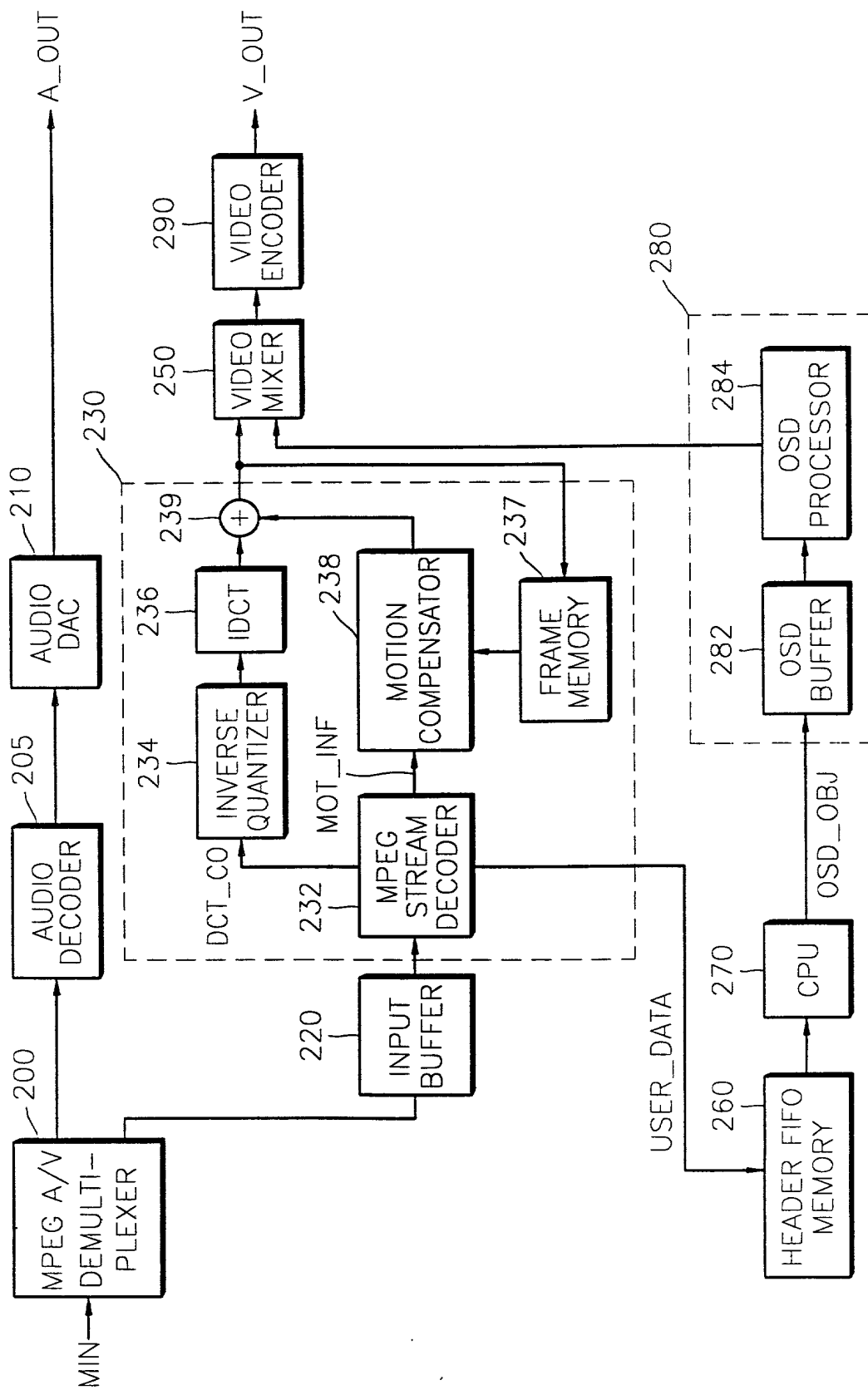


FIG. 3

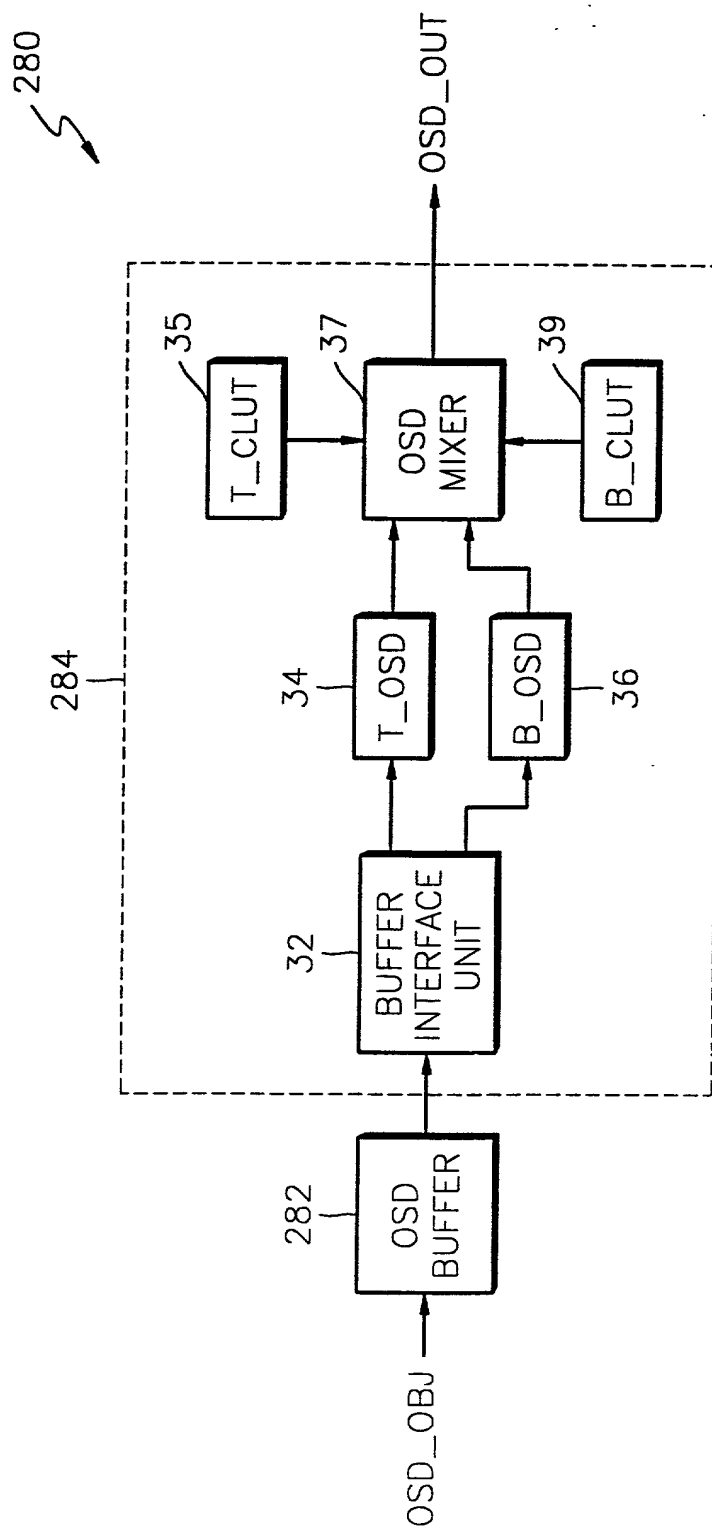
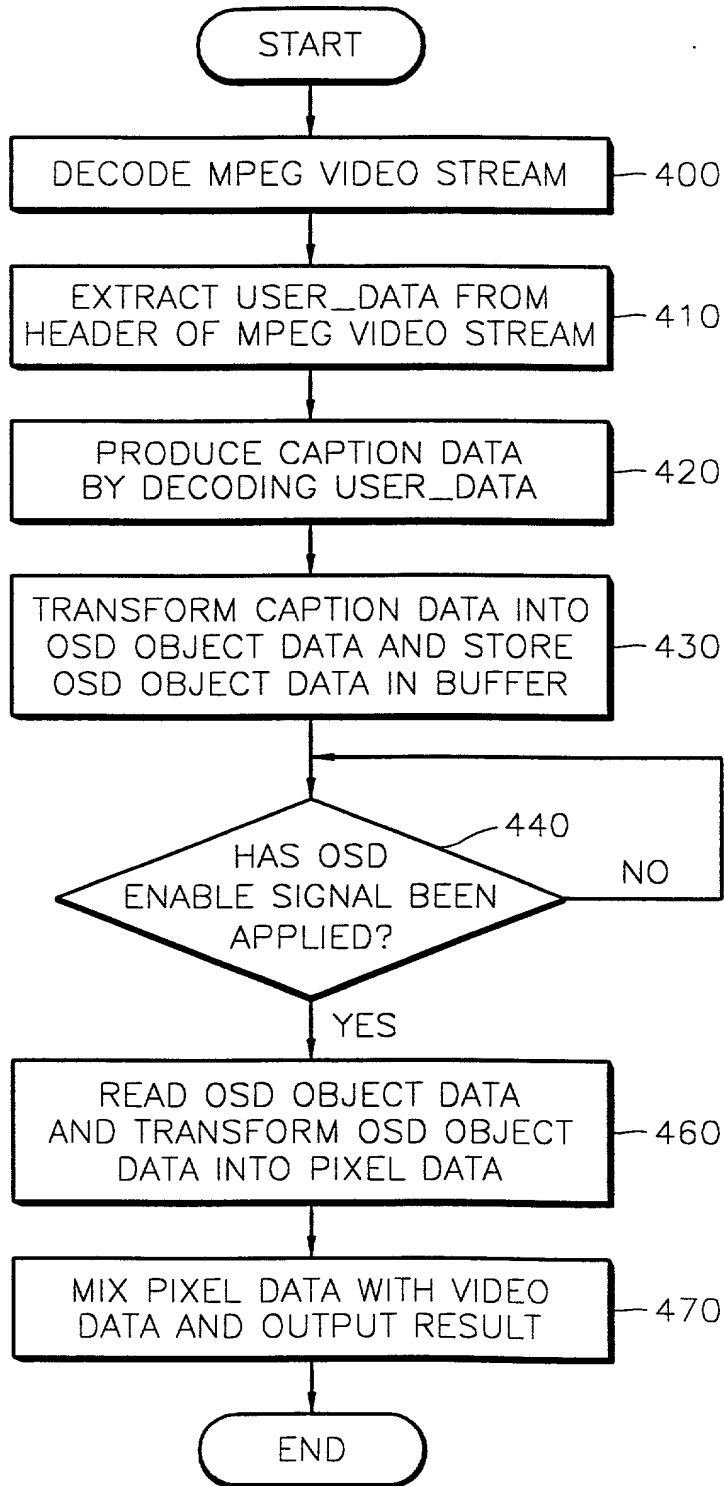



FIG. 4



*DECLARATION, PETITION AND POWER OF ATTORNEY FOR PATENT APPLICATION			Attorney Docket No: SAMJ-098
<p>As a below named inventor, I hereby declare that:</p> <p>My residence, post office address and citizenship are as stated below next to my name,</p> <p>I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:</p> <p style="text-align: center;">MOVING PICTURE EXPERTS GROUP DECODING APPARATUS AND METHOD FOR CAPTION DISPLAY</p> <p>the specification of which (check only one):</p> <p><u> X </u> is attached hereto.</p> <p><u> </u> was filed as United States Patent Application</p> <p>Serial No. _____</p> <p>on _____</p> <p>and was amended</p> <p>on _____</p> <p style="text-align: center;">(if applicable)</p> <p><u> </u> was filed as PCT Patent Application</p> <p>Serial No. _____</p> <p>on _____</p> <p>and was amended under PCT Article 19</p> <p>on _____</p> <p style="text-align: center;">(if applicable)</p> <p>I hereby state that I have reviewed and understand the contents of the specification, including the claims as amended by any amendment referred to herein.</p> <p>I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.</p> <p>I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:</p>			
PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119:			
COUNTRY (if PCT indicate PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. § 119 (YES/NO)
Republic of Korea	99-3221	1 February 1999	YES

DECLARATION, PETITION AND POWER OF ATTORNEY FOR PATENT APPLICATION		Attorney Docket No: SAMJ-098	
I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below.			
PRIOR U.S. APPLICATIONS FOR BENEFIT UNDER 35 U.S.C. § 119(e):			
APPLICATION NUMBER		FILING DATE	
I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56 which occurred between the filing date of the prior applications and the national or PCT international filing date of this application:			
PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATION(S) DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. § 120:			
APPLICATION NUMBER (if PCT indicate PCT)		DATE OF FILING (day, month, year)	STATUS: (PATENTED, PENDING OR ABANDONED)
POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.			
Maurice E. Gauthier	Reg. No. 20,798	Patrick J. O'Shea	Reg. No. 35,305
Richard L. Stevens	Reg. No. 24,445	Arlene J. Powers	Reg. No. 35,985
Matthew E. Connors	Reg. No. 33,298	Steven M. Mills	Reg. No. 36,610
William E. Hilton	Reg. No. 35,192	Anthony P. Onello, Jr.	Reg. No. 38,572
Send Correspondence to:		Direct Telephone Calls to:	
Steven M. Mills, Esq. Samuels, Gauthier & Stevens LLP 225 Franklin Street Boston, Massachusetts 02110		Steven M. Mills, Esq. (617) 426-9180 Ext. 149 (617) 426-2275 (facsimile)	
Wherefore I petition that letters patent be granted to me for the invention or discovery described and claimed in the attached specification and claims, and hereby subscribe my name to said specification and claims and to the foregoing declaration, power of attorney, and this petition.			
I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.			
Signature 		Date <i>January 6, 2000</i>	
Full Name of 1st Inventor	Family Name Yu	First Given Name Han Ju	Second Given Name
Residence & Citizenship	City Chungcheongnam-do	State or Foreign Country Republic of Korea	Country of Citizenship Republic of Korea
Post Office Address	Post Office Address 814, Kumsung Apt., Kumsung-myeon, Kumsan-gun	City Chungcheongnam-do	State & Zip Code/Country Republic of Korea

DECLARATION, PETITION AND POWER OF ATTORNEY FOR PATENT APPLICATION			Attorney Docket No: SAMJ-098
Signature <i>Donheo Jung</i>		Date <i>January 10, 2000</i>	
Full Name of 2 nd Inventor	Family Name Jung	First Given Name Don-he	Second Given Name
Residence & Citizenship	City Seoul	State or Foreign Country Republic of Korea	Country of Citizenship Republic of Korea
Post Office Address	Post Office Address 87-405, Banpo Apt., Banpobon-dong, Seocho-gu	City Seoul	State & Zip Code/Country Republic of Korea
Signature <i>Hyukjong Wang</i>		Date <i>January 6, 2000</i>	
Full Name of 3 rd Inventor	Family Name Wang	First Given Name Hyuk-jong	Second Given Name
Residence & Citizenship	City Seoul	State or Foreign Country Republic of Korea	Country of Citizenship Republic of Korea
Post Office Address	Post Office Address 105, 1643-18, Seocho 1-dong, Seocho-gu	City Seoul	State & Zip Code/Country Republic of Korea